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NASA TECH BRIEF

Composite Metal-Oxide Device Has Voltage Sensitive Capacitance

A composite metal-oxide device (see Fig. 1) exhibits two discrete voltage-dependent capacitance values. The step function variation of the capacitance makes the device useful for voltage-controlled oscillator circuits and as a voltage-sensitive switch.

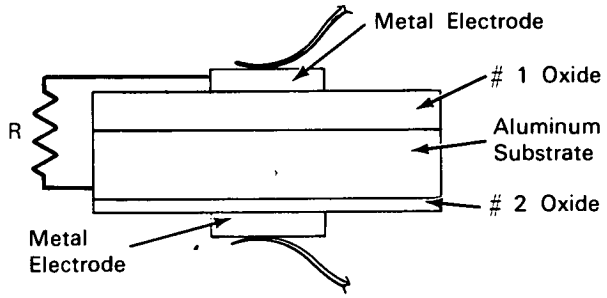

Figure 1. Device Structure

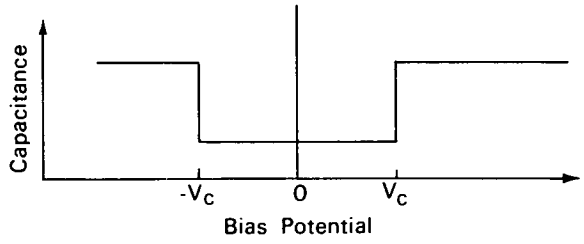

Figure 2. Device Characteristics

The small signal capacitance, as a function of dc bias, (see Fig. 2), is nearly a step function. As the bias passes the critical potential, V_c, the capacitance switches between the low and high values. When the bias potential is above V_c, the capacitance is high. It remains constant at this value as the bias potential is reduced to V_c. The capacitance of the device switches to its low value as the dc bias drops below V_c. The switching effect is believed to be due to field emission through the thin oxide #2.

The substrate is pure aluminum. Oxide #1 is grown by means of an anodic oxidizing process; oxide #2, which is approximately 50-100 Å, is thermally grown in an oxygen atmosphere at high temperatures. After the oxides are formed, metal electrodes are vapor deposited in a vacuum of about 10^{-5} torr. The simplicity of construction makes the composite metal-oxide device suitable for large-scale integration, microelectronic circuits.

Note:

Requests for further information may be directed to:

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Patent status:

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Category 01